

WHAT IS CLAIMED IS:

1. Apparatus for treating a liquid sample stream including at least one
analyte ion species and matrix ion species of opposite charge to said one analyte
ion species, said apparatus comprising

a housing defining a flow-through treatment channel bounded by a liquid
sample stream wall opposed from a spaced, generally parallel carrier liquid
stream wall, said treatment channel including an inlet and an outlet,

a source of said liquid sample stream in fluid communication with said
treatment channel inlet,

a source of a carrier liquid stream including a matrix ion species capture
material in fluid communication with said treatment channel inlet,

said sample stream and carrier liquid stream being disposed in said
treatment channel in substantially parallel flowing streams extending between the
treatment channel inlet and outlet forming a liquid interface between said parallel
streams, said matrix ion species being present at a substantially lower
concentration in said sample stream at said treatment channel outlet than at said
treatment channel inlet.

2. The apparatus of Claim 1 further comprising:

a detector for said one analyte ion species in said sample stream, and
a fluid conduit providing fluid communication between said treatment
channel outlet and said detector, said sample stream flowing through said
conduit.

3. The apparatus of Claim 1 further comprising a chromatography separator
in fluid communication with said treatment channel inlet.

4. The apparatus of Claim 1 in which said matrix ion species capture
material comprises an ion exchange material.

5. The apparatus of Claim 4 in which said ion exchange material is in liquid form and said carrier liquid stream is an organic liquid solvent for said ion exchange material.

5 6. The apparatus of Claim 4 in which said ion exchange material comprises solid ion exchange particles suspended in said carrier liquid stream.

7. The apparatus of Claim 1 in which said carrier liquid stream is substantially immiscible in said liquid sample stream.

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8. The apparatus of Claim 1 in which said liquid sample stream is aqueous.

9. The apparatus of Claim 1 in which said carrier liquid stream is immiscible in said liquid sample stream.

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10. The apparatus of Claim 1 in which said sample stream at said treatment channel outlet is suppressed with respect to said matrix ion species.

11. The apparatus of Claim 1 in which said parallel streams are substantially planar.

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12. A method for treating a liquid sample stream including at least one analyte species ion and matrix ion species of opposite charge to said one analyte ion species, said method comprising flowing said sample stream from an inlet in a flow-through treatment channel to an outlet thereof, and flowing a carrier liquid stream including a matrix ion species capture material through said flow-through chamber, said sample stream and carrier liquid stream flowing substantially parallel to each other in said treatment channel and forming a liquid interface between them, said matrix ion species in said sample stream diffusing through said interface to contact and become bound by said capture material in said

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carrier liquid so that the concentration of said matrix ion species at said outlet is at a substantially lower concentration than at said inlet.

5 13. The method of Claim 12 in which no substantial amount of said capture material in said carrier liquid stream flows into said sample stream in said treatment channel.

10 14. The method of Claim 13 further comprising detecting said one analyte ion species in said sample stream.

15 15. The method of Claim 14 further comprising separating said sample stream and carrier liquid stream exiting from said treatment channel prior to detecting.

16. The method of Claim 15 in which said sample stream comprises at least a second analyte ion species, said method further comprising separating said one and second analyte ion species in said sample stream prior to said treating step.

20 17. The method of Claim 12 in which said matrix ion species capture material comprises an ion exchange material.

25 18. The method of Claim 17 in which said liquid sample stream is aqueous, said ion exchange material is in liquid form, and said carrier liquid stream is an organic liquid solvent for said ion exchange material.

19. The method of Claim 17 in which said ion exchange material comprises solid ion exchange particles suspended in said carrier liquid stream.

30 20. The method of Claim 12 in which said carrier liquid stream is substantially immiscible in said aqueous liquid stream.

21. The method of Claim 12 in which said carrier liquid stream is substantially miscible in said aqueous liquid stream.
- 5 22. The method of Claim 16 in which said matrix ion species is suppressed on exiting said treatment channel.
23. The method of Claim 12 in which said liquid interface is disposed substantially horizontally.
- 10 24. The method of Claim 12 in which said liquid interface is disposed substantially vertically.
25. The method of Claim 12 in which said capture material binds said matrix ion species by forming a salt or complex.
- 15 26. The method of Claim 12 in which said sample stream and carrier liquid stream flow under substantially laminar flow conditions.
27. The method of Claim 12 in which said parallel streams are substantially planar.
- 20 28. The method of Claim 12 performed in the absence of an applied electric current.

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